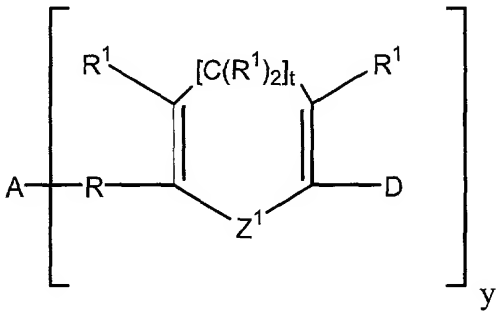
CLAIMS

What is claimed is:

1. A radiation-curable composition, comprising a cationic photoinitiator and a radiation-curable polymer represented by Structural Formula I:




I.

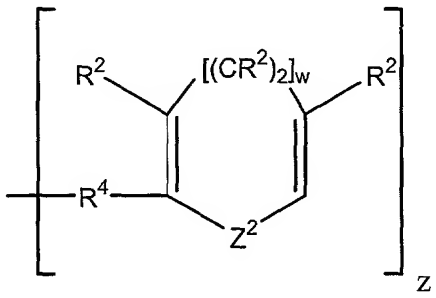
wherein:

A is a substituted or unsubstituted hydrocarbon;

R is a polymer chain;

$Z^1$ is selected from the group consisting of -O-, -S- and $-NR^7-$;

D is -H or a group represented by Structural Formula II:




II.

$Z^2$ is selected from the group consisting of -O-, -S- and $-NR^8-$;

$R^1$ and $R^2$ for each occurrence are, independently, selected from the

group consisting of -H, -$OR^5$, -$NR^5R^6$, a substituted or unsubstituted alkyl, a substituted or unsubstituted cycloalkyl, and a substituted or unsubstituted heterocycloalkyl;

$R^4$ is selected from a substituted or unsubstituted alkylene, a substituted or unsubstituted cycloalkylene, a substituted or unsubstituted heteroalkylene, and a substituted or unsubstituted heterocycloalkylene;

$R^5$ and $R^6$ are each, independently, selected from the group consisting of -H, a substituted or unsubstituted alkyl, a substituted or unsubstituted cycloalkyl, and a substituted or unsubstituted heterocycloalkyl; or

$R^5$ and $R^6$ together with the nitrogen to which they are attached form a substituted or unsubstituted heterocycloalkyl; and

$R^7$ and $R^8$ are each, independently, selected from the group consisting of -H, a substituted or unsubstituted alkyl, a substituted or unsubstituted cycloalkyl, and a substituted or unsubstituted heterocycloalkyl;

t and w are each independently 0 or an integer from 1-5; and

y and z are each, independently, a positive integer.

2. The composition of Claim 1, wherein:

$Z^1$ is -O-;

t is 0;

D is -H;

R is a polymer chain wherein at least 50% of the repeating units of the polymer chain are isobutylene units;

$R^1$ for each occurrence is -H;

y is 2 or 3; and

A is a divalent or trivalent phenyl.

3. The composition of Claim 1 wherein:

$Z^1$ is -O-;

t is 0;

D is a group represented by Structural Formula II;

$Z^2$ is -O-;

w is 0;

R is a polymer chain wherein at least 50% of the repeating units of the polymer chain are isobutylene units;

$R^1$ and $R^2$ for each occurrence are -H;

$R^4$ is an alkylene;

y is 2 or 3;

z is 1; and

A is a divalent or trivalent phenyl.

4. The composition of Claim 1 wherein:

$Z^1$ is -S-;

t is 0;

D is -H;

R is a polymer chain wherein at least 50% of the repeating units of the polymer chain are isobutylene units;

$R^1$ for each occurrence is -H;

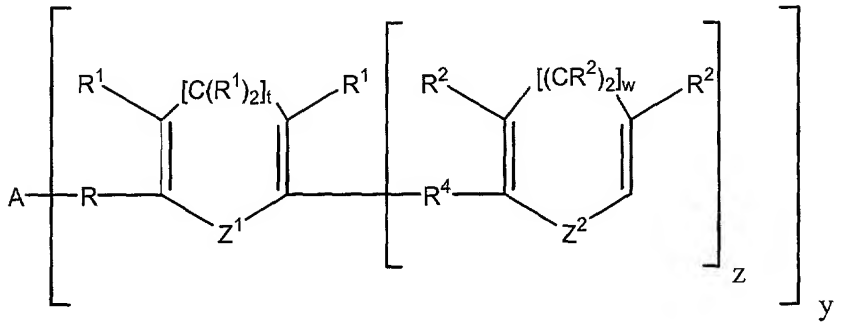
y is 2 or 3; and

A is a divalent or trivalent phenyl.

5. The composition of Claim 1, wherein the cationic photoinitiator is selected from the group consisting of an onium salt, a diaryliodonium salt of sulfonic acid, a triarylsulfonium salt of sulfonic acid, a diaryliodonium salt of boric acid, and a triarylsulfonium salt of boric acid.

6. The composition of Claim 5, wherein the cationic photoinitiator is diaryliodonium hexafluoroantimonate.

7. A radiation-curable polymer represented by Structural Formula III:



III.

wherein:

A is a substituted or unsubstituted hydrocarbon;

R is a polymer chain;

$Z^1$ is selected from the group consisting of -O-, -S- and $-NR^7$-;

$Z^2$ is selected from the group consisting of -O-, -S- and $-NR^8$-;

$R^1$ and $R^2$ for each occurrence are, independently, selected from the group consisting of -H, $-OR^5$, $-NR^5R^6$, a substituted or unsubstituted alkyl, a substituted or unsubstituted cycloalkyl, and a substituted or unsubstituted heterocycloalkyl;

$R^4$ is selected form a substituted or unsubstituted alkylene, a substituted or unsubstituted cycloalkylene, a substituted or unsubstituted heteroalkylene, and a substituted or unsubstituted heterocycloalkylene;

$R^5$ and $R^6$ are each, independently, selected from the group consisting of -H, a substituted or unsubstituted alkyl, a substituted or unsubstituted cycloalkyl, and a substituted or unsubstituted heterocycloalkyl; or

$R^5$ and $R^6$ together with the nitrogen to which they are attached form a substituted or unsubstituted heterocycloalkyl; and

$R^7$ and $R^8$ are each, independently, selected from the group consisting of -H, a substituted or unsubstituted alkyl, a substituted or unsubstituted cycloalkyl, and a substituted or unsubstituted heterocycloalkyl;

t and w are each independently 0 or an integer from 1-5; and

y and z are each, independently, a positive integer.

8. The polymer of Claim 7 wherein:

$Z^1$ and $Z^2$ are -O-;

t and w are 0;

R is a polymer chain wherein at least 50% of the repeating units of the polymer chain are isobutylene units;

$R^1$ and $R^2$ for each occurrence are -H;

$R^4$ is an alkylene;

y is 2 or 3;

z is 1; and

A is a divalent or trivalent phenyl.

9. The polymer of Claim 8, wherein $R^4$ is methylene or dimethylmethylene.

10. The polymer of Claim 7 wherein:

$Z^1$ and $Z^2$ are -S-;

t and w are 0;

R is a polymer chain wherein at least 50% of the repeating units of the polymer chain are isobutylene units;

$R^1$ and $R^2$ for each occurrence are -H;

$R^4$ is an alkylene;

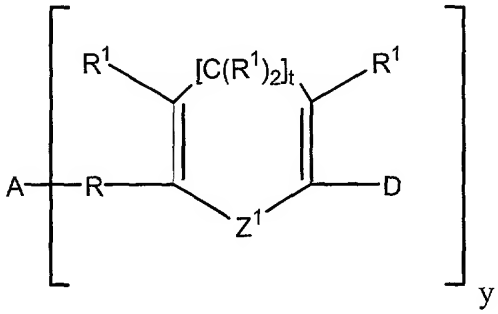
y is 2 or 3;

Z is 1; and

A is a divalent or trivalent phenyl.

11. The polymer of Claim 10, wherein $R^4$ is methylene or dimethylmethylene.

12. A method of forming a radiation-curable polymer, represented by Structural Formula I:



I.

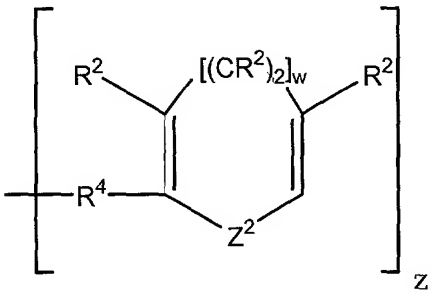
wherein:

A is a substituted or unsubstituted hydrocarbon;

R is a polymer chain;

$Z^1$ is selected from the group consisting of -O-, -S- and $-NR^7-$;

D is -H or a group represented by Structural Formula II:



II.

$Z^2$ is selected from the group consisting of -O-, -S- and $-NR^8-$;

$R^1$ and $R^2$ for each occurrence are, independently, selected from the group consisting of -H, $-OR^5$, $-NR^5R^6$, a substituted or unsubstituted alkyl, a substituted or unsubstituted cycloalkyl, and a substituted or unsubstituted heterocycloalkyl;

$R^4$ is selected from a substituted or unsubstituted alkylene, a substituted or unsubstituted cycloalkylene, a substituted or unsubstituted heteroalkylene, and a substituted or unsubstituted heterocycloalkylene;

$R^5$ and $R^6$ are each, independently, selected from the group consisting of -H, a substituted or unsubstituted alkyl, a substituted or unsubstituted cycloalkyl, and a substituted or unsubstituted heterocycloalkyl; or

$R^5$ and $R^6$ together with the nitrogen to which they are attached form a substituted or unsubstituted heterocycloalkyl; and

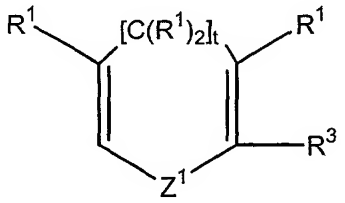
$R^7$ and $R^8$ are each, independently, selected from the group consisting of -H, a substituted or unsubstituted alkyl, a substituted or unsubstituted cycloalkyl, and a substituted or unsubstituted heterocycloalkyl;

t and w are each independently 0 or an integer from 1-5; and

y and z are each, independently, a positive integer, comprising the steps:

a) contacting under reaction conditions a cationically polymerizable monomer with a cationic polymerization catalyst to produce a living polymer; and thereafter;

b) reacting the living polymer with an end capping compound having the following structural formula:




IV.

wherein:

$R^3$ is is $-Sn(R^{18})_3$, $-Si(R^{18})_3$ or -D, thereby forming the radiation-curable polymer.

13. The method of Claim 12, wherein an initiator is contacted with a cationic polymerization catalyst under reaction conditions followed by addition of the cationic polymerizable monomer.

14. The method of Claim 13 wherein:

the initiator is a substituted benzene having from one to three 1-chloro-1-methylethyl groups and from zero to about three t-butyl groups; and

the cationic polymerization catalyst is $TiCl_4$ or $BCl_3$.

15. The method of Claim 14, wherein:

$Z^1$ and $Z^2$ are -O-;

t and w are 0;

$R^3$ is -D and is a group represented by Structural Formula II;

$R^4$ is an alkylene;

z is 1; and

the living polymer comprises at least 50% isobutylene units.

16. The method of Claim 14, wherein:

$Z^1$ and $Z^2$ are -S-;

t and w are 0;

$R^3$ is -D and is a group represented by Structural Formula II;

$R^4$ is an alkylene;

z is 1; and

the living polymer comprises at least 50% isobutylene units.

17. A radiation-curable polymer prepared by the method of Claim 12.